SLOVENSKI STANDARD
SIST EN 13487:2019

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Nadomešča:
SIST EN 13487:2004

Prenosniki toplote - Zračno hlajeni kondenzatorji in hladilniki kapljevine s prisilno konvekcijo - Merjenje hrupa

Heat exchangers - Forced convection air cooled refrigerant condensers and dry coolers - Sound measurement

Wärmeübertrager - Ventilatorbelüftete Kältemittelverflüssiger und Trockenkühltürme - Schallmessung

Echangeurs thermiques - Aérocondenseur à convection forcée et batterie froide - Mesurage du bruit

Ta slovenski standard je istoveten z: **EN 13487:2019**

ICS:

17.140.20	Emisija hrupa naprav in opreme	Noise emitted by machines and equipment
27.060.30	Grelniki vode in prenosniki toplote	Boilers and heat exchangers

SIST EN 13487:2019 **en,fr,de**

EUROPEAN STANDARD

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English Version

Heat exchanger - Forced convection air cooled refrigerant condensers and dry coolers - Sound measurement

Echangeurs thermiques - Aérocondenseur à convection forcée et batterie froide - Mesurage du bruit

Wärmeübertrager - Ventilatorbelüftete Kältemittelverflüssiger und Trockenkühltürme - Schallmessung

This European Standard was approved by CEN on 17 June 2019.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 13487:2019) has been prepared by Technical Committee CEN/TC 110 “Heat exchangers”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2020 and conflicting national standards shall be withdrawn at the latest by February 2020.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13487:2003.

The main changes compared to the previous edition are:

a) the Scope was completely revised;

b) the Normative references were updated;

c) Terms and Definitions were updated and new terms were introduced;

d) the whole document, including Annexes, was completely revised and rearranged.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document is one of a series dedicated to heat exchangers.

This document provides information for assessing and presenting the acoustic characteristics of heat exchangers in fan operation.

This document also provides information necessary for specifying and selecting the product which best suits the needs of the purchaser.

1 Scope

1.1 General

This document is one of a series dedicated to air-cooled heat exchangers.

— forced convection air cooled refrigerant condensers as specified in EN 327;

— forced convection unit air coolers for refrigeration as specified in EN 328;

— air cooled liquid coolers "dry coolers" as specified in EN 1048.

This document provides information for assessing and presenting the acoustic emission characteristics of heat exchangers under stationary operating conditions.

This document is applicable to selfstanding forced convection air cooled refrigerant condensers and air cooled liquid coolers "dry coolers" and air coolers.

1.2 Size of source

The method specified in EN ISO 3744, EN ISO 3745, EN ISO 3746, EN ISO 9614-1, EN ISO 9614-2 and EN ISO 9614-3 is applicable to noise sources of any size. Limitations for the size of the source are given in 1.3 of EN ISO 3741:2010, EN ISO 3743-1:2010 and EN ISO 3743-2:2009.

1.3 Object

This document offers ways to determine the sound power level of units. Some of them are specifically adapted to provide results with low uncertainties, by using laboratory class or engineering class acoustic methods under highly controlled working conditions. Those results are suitable for certification, labeling and marking purposes.

This document is concerned with objective methods for determining sound power levels L_W, expressed in decibels (dB) with reference to a sound power of one picowatt (1 pW), of airborne acoustical noise within the specified frequency range of interest and for prescribed operating conditions of the appliance to be measured:

— A-weighted sound power level, L_{WA};

— spectral sound power levels;

— emission sound pressure level at workplace, L_{pA}.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 3741:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Precision methods for reverberation test rooms (ISO 3741:2010)*

EN ISO 3743-1:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for small movable sources in reverberant fields - Part 1: Comparison method for a hard-walled test room (ISO 3743-1:2010)*

EN ISO 3743-2:2009, *Acoustics - Determination of sound power levels of noise sources using sound pressure - Engineering methods for small, movable sources in reverberant fields - Part 2: Methods for special reverberation test rooms (ISO 3743-2:1994)*

EN ISO 3744:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane (ISO 3744:2010)*

EN ISO 3745:2012/A1:2017, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Precision methods for anechoic rooms and hemi-anechoic rooms - Amendment 1 (ISO 3745:2012/Amd 1:2017)*

EN ISO 3746:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:2010)*

EN ISO 4871, *Acoustics - Declaration and verification of noise emission values of machinery and equipment (ISO 4871)*

EN ISO 9614-1:2009, *Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 1: Measurement at discrete points (ISO 9614-1:1993)*

EN ISO 9614-2:1996, *Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 2: Measurement by scanning (ISO 9614-2:1996)*

EN ISO 9614-3:2009, *Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 3: Precision method for measurement by scanning (ISO 9614-3:2002)*

EN ISO 11203:2009, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level (ISO 11203:1995)*

ISO 7574-4, *Acoustics — Statistical methods for determining and verifying stated noise emission values of machinery and equipment — Part 4: Methods for stated values for batches of machines*

EN 60038, *CENELEC standard voltages (IEC 60038)*

3 Terms and definitions

For the purposes of this document, the terms and definitions pertinent to the determination of sound power levels given in EN ISO 3741, EN ISO 3743-1, EN ISO 3743-2, EN ISO 3744, EN ISO 3746, EN ISO 9614-1, EN ISO 9614-2 and EN ISO 9614-3 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
forced convection air cooled refrigerant condenser
refrigeration system component that condenses refrigerant vapour by rejecting heat to air, which is mechanically circulated over its dry heat transfer surface by integral fans and fan drives

Note 1 to entry: In the following "forced convection air cooled refrigerant condenser" is referred to as "apparatus".

[SOURCE: EN 327:2014, 3.1]

Note 2 to entry: The heat transfer coil includes distributing and collecting headers.

3.2
forced convection air cooled liquid cooler
dry cooler
self contained system that cools a single phase liquid by rejecting sensible heat via a heat exchanger to air that is mechanically circulated by integral fans

Note 1 to entry: In the following "forced convection air cooled liquid cooler; dry cooler" is referred to as "apparatus".

[SOURCE: EN 1048:2014, 3.1]

3.3
forced convection unit air cooler
refrigeration system component transferring heat from air to a refrigerant or liquid, the air is mechanically circulated over the heat transfer surface by integral fan(s) and fan drive(s)

Note 1 to entry: The heat transfer coil includes refrigerant distributing and collecting headers.

Note 2 to entry: In the following “forced convection unit air cooler” is referred to as “apparatus”.

3.4
emission sound pressure level
L_p
ten times the logarithm to the base 10 of the ratio of the square of the emission sound pressure, p, to the square of the reference value, p_0, measured with a particular time weighting and a particular frequency weighting

Note 1 to entry: Time and frequency weightings are selected from those defined in EN 61672-1 expressed in decibels:

$$L_p = 10lg\frac{p^2}{p_0^2}dB$$

where the reference value, p_0, is 20 µPa.

Note 2 to entry: The emission sound pressure level shall be determined at a specified position in accordance with either a test code for a specific family of machines or, if no test code exists, a method that complies with the EN ISO 11200 series.

[SOURCE: EN ISO 11200:2014, 3.3]

3.5
sound power level
L_W
ten times the logarithm to the base 10 of the ratio of the sound power of a source, P, to a reference value, P_0, expressed in decibels

$$L_W = 10lg\frac{P}{P_0}dB$$

where the reference value, P_0, is 1 pW

Note 1 to entry: If a specific frequency weighting as specified in IEC 61672-1 and/or specific frequency bands are applied, this is indicated by appropriate subscripts; e.g. L_{WA} denotes the A-weighted sound power level.

Note 2 to entry: This definition is technically in accordance with ISO 80000-8:2007[2], 8-23.

[SOURCE: ISO/TR 25417:2007, 2.9 and EN ISO 3744:2010, 3.21]

3.6
frequency range of interest
for general purposes, the frequency range of octave bands with nominal mid-band frequencies from 125 Hz to 8 000 Hz (including one-third octave bands with mid-band frequencies from 100 Hz to 10 000 Hz)

Note 1 to entry: For special purposes, the frequency range can be extended or reduced, provided that the test environment and instrument specifications are satisfactory for use over the modified frequency range. Changes to the frequency range of interest are included in the test report.

[SOURCE: EN ISO 3744:2010, 3.9]

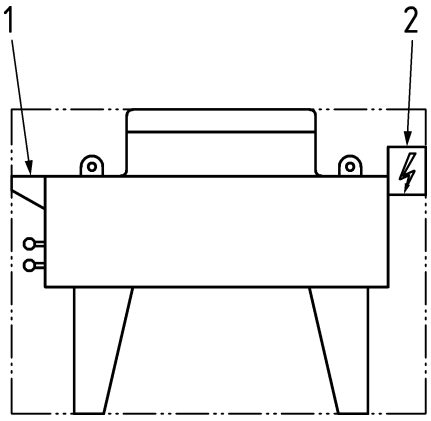
Note 2 to entry: For sources which emit sound at predominantly high or low frequencies, the frequency range of interest can be extended to include these frequencies.

3.7
reference box
hypothetical right parallelepiped terminating on the reflecting plane(s) on which the noise source under test is located, that just encloses the source including all the significant sound radiating components and any test table on which the source is mounted

Note 1 to entry: If required, the smallest possible test table can be used for compatibility with emission sound pressure measurements at bystander positions in accordance with, for example, EN ISO 11201.

[SOURCE: EN ISO 3744:2010, 3.10]

Note 2 to entry: The reference box encloses the whole casing, including, if applicable, its normal supporting legs, fans, piping cover plates (see mark 1 in Figure 1) and control/junction boxes (see mark 2 in Figure 1). Refrigerant/liquid connections, headers (collectors) and electrical supply cables are not taken into account when determining the reference box. A typical model is given in Figure 1.



Key

1 piping cover plate

2 control/junction box

Figure 1 — Reference box

3.8
measurement surface

hypothetical surface of area, *S*, on which the microphone positions are located at which the sound pressure levels are measured, enveloping the noise source under test and terminating on the reflecting plane(s) on which the source is located

[SOURCE: EN ISO 3744:2010, 3.14]

3.9
background noise

noise from all sources other than the source under test

Note 1 to entry: Background noise includes contributions from airborne sound, noise from structure-borne vibration, and electrical noise in the instrumentation.

[SOURCE: EN ISO 3744:2010, 3.15]

3.10
module

geometrically similar group of components from which, when multiplied by an integer number, an apparatus is built

Note 1 to entry: A module typically comprises:

— fan with motor;

— a heat exchanger coil;

— a casing which ensures the conduction of the air flow as intended, including supporting legs for vertical air flow.